Georgetown Pike and Walker Road Crossroads Vicinity
Sewage Disposal System Functionality Survey
September 2004 & July 2005

Purpose

Determine the condition of existing onsite sewage disposal systems serving the commercial properties located at the Georgetown Pike and Walker Road crossroads vicinity in the Great Falls area of Fairfax County. The survey attempts to predict sustainability and/or long term function of the onsite sewage disposal systems.

Introduction

Onsite sewage disposal systems are a vital solution to sewage treatment and disposal for approximately 35,000 homes and businesses without access to the public sewerage system in Fairfax County.

Onsite sewage disposal systems have a limited useful lifetime. System longevity and proper function of systems is directly related to hydraulic loading, waste strength, regular maintenance, and age. Failure of onsite sewage disposal systems to function properly leads to loss of real property values, environmental degradation, ground water quality contamination and increased risk of waterborne disease.

Traditionally, the typical onsite sewage disposal system consists primarily of a septic tank, distribution box, and a trenched subsurface soil absorption system (drain field). The septic tank is a buried watertight container used to clarify and partially treat wastewater. The septic tank also serves as a settling basin to separate the scum and grit from the liquid. The effluent from the tank is sent to the distribution box (es) for distribution to the soil absorption area and ultimate disposal.[1]

The distribution box distributes the flow of sewage effluent evenly among the drain field trenches. Until 1991 distribution boxes were constructed primarily of concrete. Age related deterioration of concrete distribution boxes can cause the box to disintegrate and unevenly distribute sewage to the drain field trenches resulting in premature failure of the drain field trenches. The life of concrete distribution boxes is thought to be approximately 20 years. In 1991 plastic distribution boxes were introduced into the market and are now the product of choice because they do not experience age related deterioration.

In 1972 the Flow Diversion Valve (FDV) was introduced into the design of onsite sewage disposal systems. The function of the FDV is to divert the flow of effluent to one half of the soil absorption area for a period of one year while the remaining half of the absorption area rests. Resting one half of the drain field allows it to rejuvenate itself. The property owner is notified annually by the Health Department that it is time to turn their FDV. The FDV concept is proven to extend the life of an onsite sewage disposal system.

[1] Metcalf, Leonard. Transactions of the American Society of Civil Engineers, No. 909. December 1901. p. 472.

The soil absorption area or drain field area consists of a number of trenches filled with gravel. A perforated pipe is laid in the center of the trench on a gravel bed. Sewage flows from the distribution box and through the pipe where it is dispersed through the gravel which filters the sewage before it enters the soil. The soil receiving the sewage cleanses it by both filtration and bacteriological action. A biological slime layer (biomat) is formed on the gravel and soil interface. The biomat acts as a filter of particulate matter from the effluent. The other mechanism for cleansing sewage is by biological action. The organic material carried into the drain field, including bacteria and viruses, is subject to being utilized by organisms which normally live in the soil, such as insects, worms, and soil bacterial action.[2] Over time the fine solids and biomat accumulations will seal the absorptive capacity of the soil and prevent percolation of the effluent into the soil matrix. At this time effluent may accumulate in the absorption trenches causing ponding, saturation leading to total failure of the onsite sewage disposal system.

Some onsite sewage disposal systems require a sewage pumping station to pump effluent to a higher ground location for disposal in the drain field area. The sewage pumping station contains mechanical components such as liquid level sensors and pumps. These mechanical components periodically fail requiring repair or replacement.

Prior to 1972 it was expected that drainfield absorption areas, when properly used and maintained, would function satisfactorily for 25 to 30 years. By incorporation of the FDV into onsite sewage disposal design, the system's useful life was theoretically increased indefinitely. In 1972 a requirement that all lots have 50% replacement area or reserve area was required by Code of all onsite sewage disposal systems for lots recorded after adoption of this requirement. The replacement area or reserve area is an area set aside on a property for replacement of all or a portion of the sewage system should it fail. As of August 1, 2003 *Chapter 68.1 of the Fairfax County Code* requires a 100% replacement area for lots established after that date.

Onsite sewage disposal systems are designed to accommodate a daily volume of wastewater, measured as flow in gallons per day (GPD). Excessive hydraulic overloading or overuse of the soil absorption system will lead to premature failure of the drain field.

In addition to designing a sewage disposal system to accommodate a specific quantity of wastewater, the quality or strength of wastewater must be also considered. Residential strength sewage has lower levels of suspended solids, nutrients, fats, oils and greases than that of commercial strength sewage. Commercial establishments are designed utilizing wastewater characterization data from similar establishments to demonstrate the strength and quantity of the wastewater to be generated. Additional sewage treatment prior to disposal and additional sewage disposal absorption areas are frequently required to dispose of commercial strength wastewater today. Examples of establishments that typically exhibit high wastewater strengths are: restaurants

[2] Perkins, Richard J. Onsite Wastewater Disposal. 1989. p 13.

(including sit-down, take out, and delivery), hair & beauty salons, nail salons, medical offices, veterinary clinics, animal grooming salons, convenience stores, and any establishment that includes food preparation for sale or distribution to the public.

Regular maintenance of sewage disposal systems is critical to their longevity and proper function. Regular maintenance includes:

- Pumping of the septic tank every 3 to 5 years to remove solids and scum from the tank.
- Turning the FDV annually to allow for the proper rest period of half of the absorption area.
- Checking the distribution box(es) for age related deterioration every 10 to 15 years.
- Keeping trees and shrubs at least 10 feet from the onsite sewage disposal system prevents possible root infiltration that could result in clogging the system components.

Distribution box failure, hydraulic overloading, or excessive wastewater strengths may manifest themselves by causing subsurface wetness in the absorption area. Wetness in subsurface absorption areas is an indication that the absorption area is not functioning as designed. Complete and catastrophic failure is evidenced by total saturation of the absorption area and may also manifest itself by either a backup of sewage into the structure or by sewage flowing to the ground surface. Sewage flowing to the ground surface and back up of sewage into structures are considered health hazards and a violation of *Chapter 68.1 of the Fairfax County Code* and *the Commonwealth of Virginia, Sewage Handling and Disposal Regulations*.

Survey Method

Site investigations were conducted via records search and review within the Health Department, evaluation of existing conditions at the various sites, and conversations with facility owners and/or operators. Water usage data for establishments were obtained from Fairfax Water and/or the establishment owners/renters.

All sites were visited and inspected by staff from the Health Department during the last 2 weeks of September 2004 and last week of July 2005. Inspections of the onsite sewage disposal system sites included a “walk over” of the system and probing of the absorption ditches (probing absorption ditches is conducted via inserting a long metal probe through the soils and into the graveled portion of the ditches.). This allows for a determination of the wetness conditions in the drain field trenches. Wetness within a drain field trench is a direct indication that the system is not working as designed or that the system is near the end of its useful life.

Survey Results and Site Specific Narratives

Georgetown Pike & Walker Road, Multiple addresses, TM: 13-1-0013-6 & 13-1-009-5A, known as Great Falls Village Center Condo: These properties are served by two on site sewage disposal absorption systems. Both systems were originally installed in 1979. The smaller of the 2 systems, identified as the "Courtyard System" is designed to accommodate 1,800 GPD and serves a restaurant and several small shops. This system was expanded in 1983 by adding additional septic tanks and a pumping station. The larger of the 2 systems (mass drain field) serves the remainder of the businesses. These businesses include restaurants, hair & beauty shops, dental offices, retail shops, office buildings, a catering company, and a nail shop. A component of the larger system is a high maintenance wastewater recycling system, called a *Cycle-et*, which recycles toilet wastes (black water). All other wastewater (gray water) is pumped to the mass drain field for disposal. The mass drain field system is designed for a peak capacity of 11,905 GPD. This system has experienced multiple problems. The absorption area was replaced in 1987 due to grease build up that caused soil clogging. Problems with the wastewater distribution network were repaired in 1990. In 1994 the pipes and distribution boxes serving the distribution system were again repaired because of pipe failure and grease accumulation. The system continues to suffer from problems related to grease accumulation in the absorption area. Because of the many problems experienced in the past at this site, it is estimated that the sewage disposal system will fail in the near future. No area exists for replacement of the entire absorption area. Should the system malfunction again, pump and haul of sewage may be required. When probed the courtyard absorption area was satisfactory. The larger of the 2 drain field areas trenches displayed some signs of wetness.

9812 Georgetown Pike, TM: 13-1-001-18, Old Schoolhouse: This facility is owned by the Fairfax County Park Authority and used as a community hall and can be rented for parties, wedding receptions, etc. The facility was formerly a post office & library. The sewage disposal system serving this site was installed in 1959 and is designed to accommodate 250 GPD. No reserve area exists on the site to replace the system. The absorption area is partially located beneath a driveway and parking area. Vehicular traffic over the absorption area can cause compaction of soils and/or damage to mechanical components of the system. The drain field was dry when probed. The Health Department has no record of septic tank pump out on this property and the property owners have taken no obvious preventative maintenance measures. If food preparation is performed on site, wastes generated in these facilities are likely to exceed residential wastewater strengths.

9818 Georgetown Pike, TM: 13-1-001-15, Great Falls Grange: This is a Fairfax County facility that is served by a sewage disposal system installed in 1982 with 50% replacement area. The sewage disposal system is designed to accommodate 300 GPD peak. To date no history of problems at the site are on record with the Health Department. Health Department records indicate the septic tank was pumped in 1997 and 2001. The drain field was dry when probed. This site is currently served by an individual well water supply. Water use data was not available.

9822, 9824, 9826, and 9830 Georgetown Pike, TM: 13-1-001-11, 12, 13, 14, Great Falls Library: The library was constructed in 2000. As part of the construction process, a new sewage disposal system was installed. The new system is designed to accommodate 480 GPD peak use. The new sewage disposal system was designed with a 50% reserve area. When probed the absorption area was dry. Several trees have been planted over the absorption area. They should be removed to prevent root intrusion of the system. Quarterly water meter readings obtained in May 2004 indicate the facility is using 245 GPD of water.

9829 Georgetown Pike, TM: 13-1-001-22—25 & 25A, Great Falls Center: This site is a commercial business complex that includes a large grocery store, a beauty shop, a tavern style restaurant, a veterinary office, a nail shop, and multiple other establishments. The sewage disposal system serving these establishments was installed in 1978. The septic system is designed to accommodate a peak use of 13,942 GPD of sewage. The system experienced problems that required repairs in 1987, 1990, 1994, 1997, 2004 and 2005. Repairs to the system have included replacement of the pumping station, replacement of pumps in the pumping station, and replacement of pipes and distribution boxes serving the distribution network of the system. In 1994 disposal of dry cleaning solvents into the drain field by one the tenants caused major ground water contamination in the area surrounding the site. This resulted in public water being brought to several homes served by wells to the south of the property along Walker Road. An investigation by the Health Department resulted in The United States Environmental Protection Agency issuing an Administrative Order to remedy the problem. During the spring of 2004, the sewage lift station serving the septic system required replacement because of severe deterioration. That was accomplished in early 2005. Prior to the repair the complex was placed on temporary pump and haul for a period of 8 weeks. It was determined during the period of temporary pump and haul that the complex is using as much as 21,000 GPD of water. Sufficient area to replace the entire drain field does not exist. Future malfunction of the system may necessitate the site being placed on permanent pump and haul. When probed some of the absorption trenches were wet. Wastes generated in the shopping center complex are likely to exceed residential wastewater strengths.

9900, 9904, 9906, 9906, 9908 Georgetown Pike, TM: 13-1-001-4: This property has multiple commercial businesses to include a 7-11 Store, 2 restaurants, and a dry cleaner. The complex is served by 2 onsite sewage disposal systems. One of the sewage disposal systems, installed in 1968, failed and can not be repaired. The property owner is currently pumping and hauling sewage from the failing system. The pump out contractor is currently removing 9,500 gallons per week of sewage from the septic tanks serving this system. The remaining sewage disposal system was installed in 1975 with a peak design capacity of 826 GPD. This system had mechanical repairs performed in 1995, 1999, and 2003. When probed this absorption area was found to be wet. No replacement area exists to install a new system. Should the remaining absorption area fail, additional pump and haul will be required. Wastes generated in these facilities are likely to exceed residential wastewater strengths.

9901 Georgetown Pike, TM: 13-1-001-5A, Exxon Station: This establishment is served by a replacement onsite sewage disposal system that was installed in 1996 after total failure of the original system. Approximate design capacity of the sewage disposal system is 547 GPD. The new sewage disposal system absorption area was installed between the existing, failing drainfield trenches. Installation of absorption trenches in this manner is normally not considered as an acceptable means of permanent repair because of soil saturation from the failing system. No other replacement area exists. Failure of the repaired system will require the business to be placed on pump and haul. The drainfield trenches were dry when probed. Health Department records indicate the septic tank was last pumped in May, 2004 and that the septic tank has been pumped every 2 to 6 years. The site is currently served by an individual well water supply. Water meter readings were not available.

9912 Georgetown Pi., TM: 13-1-001-3, Oliver's Corner: This site consists of 9 commercial businesses to include a hair salon, pizza carry-out, other retail businesses and office space. The system serving the structures was installed in 1990. The system is designed for a peak capacity of 1400 GPD. No reserve area exists to replace the absorption area, should it fail. When probed, the absorption area was dry; however, the flow diversion valve was buried. Failure to turn the flow diversion valve annually can lead to premature failure of the absorption area. Health Department records indicate the septic tank was last pumped in August of 2001. Quarterly water meter readings obtained in May, 2004 indicate the facility is using 656 GPD. Wastes generated in these facilities are likely to exceed residential wastewater strengths.

9915 Georgetown Pi., TM: 13-1-001-6A, BB&T Bank: This property is served by an onsite sewage disposal system installed in 1984. The system is designed to accommodate 525 GPD. The sewage disposal system was designed with a 50% reserve area. The Health Department has no history of malfunction or repairs to the system on file for this property. Probing of the absorption area revealed no evidence of absorption area wetness or saturation; however, the landscaping and grading on the surrounding properties has caused the absorption area to now be located in a poor topographical position with minimal surface water run off potential. During wet periods potential build up of surface water over the drain field area encourages surface water infiltration into the system. This can negatively impact the system and cause premature saturation of the drainfield. Furthermore, the FDV could not be located. Failure to turn the FDV annually can lead to premature failure of the absorption area. Health Department records indicate the septic tank was last pumped in August, 2003. No records of septic tank pump out prior to this date are on file. Quarterly water meter readings obtained in May, 2004 indicate the facility is using 78 GPD of water.

9916 Georgetown Pi., TM: 13-1-001-2, Great Falls Fire Station #20: The original septic system installed to serve this property, installed in 1960, has malfunctioned and is irreparable. The establishment is currently pumping and hauling sewage. Septic tank pump out frequency at the site is not adequate as the Health Department has witnessed sewage flowing to the ground surface on repeated occasions. This condition presents a

health hazard and violates *Chapter 68.1 of the Fairfax County Code*. The Health Department has sent a notice of violation to the Fire Station requiring that the outlet tee in the septic tank be permanently sealed and the septic tank be pumped more frequently. A proposed alternative on site sewage disposal system area was approved by the Health Department in December, 2002. Water use figures at that time indicated usage of beyond 1000 GPD. The Fire Department was advised their water usage must be curtailed. Wastewater strength analysis has revealed sewage strengths generated at the facility are 3 times the strength of residential sewage. Approval of the proposed absorption area was rescinded by the Health Department in November, 2003 due to the excessive sewage strengths. Subsequent site investigations revealed that the previously proposed absorption area has been damaged by utility line installation. The pump out contractor currently removes 3,000 gallons of sewage per week from the septic tank on the property.

10001 Georgetown Pi., TM: 13-1-009-30, United States Post Office: The sewage disposal system serving the post office was installed in 2000. The system is designed to accommodate a peak flow of 420 GPD. It has a 50% reserve area available for future repairs. The drainfield area was dry when probed. The Health Department has no record of septic tank pump out on this property. Quarterly water meter readings obtained in May, 2004 indicate the facility is using 311 GPD of water.

10100 Georgetown Pi., TM: 12-2-001-16, Great Falls United Methodist Church & Parsonage House: This property is occupied by both a church and a parsonage house. Each structure is served by an individual on site sewage disposal system. The sewage disposal system serving the church is designed to accommodate 1200 GPD. This system was installed as a replacement system in 1995. Mechanical repairs to the system serving the church were conducted in 2003. The replacement sewage absorption area was dry when probed. Insufficient remaining area exists to replace the drainfield. The church currently operates a preschool. No on site food service is permitted for the preschool facility. If food service is provided for the other church functions, it is likely that wastes generated in the church exceed residential wastewater strengths.

The sewage disposal system serving the parsonage house was replaced in 1998 with a new system designed to accommodate 450 GPD. Adequate area exists to replace the absorption area with another traditional drainfield if the system should fail. The drainfield was dry when probed.

701 Walker Rd., TM: 7-4-001-55A, Great Falls Elementary School: The school is served by 2 individual onsite sewage disposal systems. The original sewage disposal system, installed during the 1950's, failed and was replaced in 1997. The new system is designed to accommodate wastewater from 600 people, or a maximum daily load of 6000 GPD. There is no replacement area should the new system fail. The Health Department has no record of septic tank pump out on this property. The drainfield was dry when probed.

717 Walker Rd., 13-1-002-B, Karate Studio/Veterinary Clinic: There is no record of the design criteria for the sewage disposal system serving this site. The system appears to have been installed in 1955. Repairs to the system, in both 1987 and 2003, include mechanical repairs to the septic tank and sewer line. Replacement area for the septic system absorption area does not exist. When probed, the existing absorption area was dry. Health Department records indicate the septic tank was last pumped in April, 2003. The tank is pumped every 3 years. The site is currently served by an individual well water supply. No water meter readings were available. Wastes generated in these facilities are likely to exceed residential wastewater strengths.

718 Walker Rd., 13-1-001-1, Pool & Spa Business: Construction and design details of the sewage disposal system serving this establishment are unknown. There is no record of repairs to the sewage disposal system. There are no records of septic tank pump out for this property. When probed, the existing absorption area was dry.

719 Walker Rd., TM: 13-1-002-1A1, Great Falls Automotive, Inc: The sewage disposal system at this site was originally installed in 1964. Design capacity of the existing system is unknown. Repairs to the system include replacement of the distribution box in 1994. When probed, one third of the absorption lines were found to be wet. A permit to uncover and replace or repair the existing distribution box was issued. The repairs were completed satisfactorily. The Health Department has no record of septic tank pump out on this property. Soils studies conducted in 2003 revealed suitable area exists to replace the existing on site sewage disposal system with an alternative onsite sewage disposal system large enough to accommodate 600 GPD peak use. The property owners requested an exception to *Chapter 68.1 of the Fairfax County Code*, to exempt the site from requiring reserve area. The owner of the property is in the process of converting the structure to a drive through oil change/automobile service center. Conversion of the service center will require installation of the new sewage disposal system. The site is currently served by an individual well water supply. No water meter readings were available.

721 Walker Rd., TM: 13-1-002-1A2, Lawn Mower Repair Shop: The system serving this site was installed in 1969. The absorption area consists of only one absorption ditch. This type of system would not be designed or approved today. Peak design flows for this system are unknown. The system had mechanical repairs conducted in 1985 and 1990. The system malfunctioned in 2002 because of a clogged pipe in the absorption area. The drainfield line was found to be slightly wet to very wet in places. Health Department records indicate the septic tank was last pumped in July, 2004 and that the tank is pumped every 2 to 6 years. Repair area to replace the sewage disposal system is available and would consist of alternative technologies and require abandonment of the existing well. The site is currently served by an individual well water supply. No water meter readings were available.

731 Walker Rd., TM: 13-1-0010-1A1 thru 1H2, Great Falls Business Center: This site has multiple businesses that are served by 2 individual on site sewage disposal systems. Both sewage disposal systems were installed in 1984. Types of

establishments occupying the facility are: 2 doctor's offices, a real estate office, a tack and tack shop, a nail salon, and an insurance business. Combined peak design flow for the systems is 2,740 GPD. Insufficient area exists for complete replacement of the sewage disposal system. When probed, the existing absorption area was dry. Health Department records do not indicate any history of malfunction. Quarterly water meter readings obtained in May 2004 indicate the facility is using 745 GPD of water. Wastes generated in these facilities are likely to exceed residential wastewater strengths.

737 Walker Rd., TM: 13-1-001-11A, Professional Center Association: The commercial businesses are served by an onsite sewage disposal system installed in 1979. The businesses located in the structure consist of business offices and a medical office. The septic system experienced mechanical problems in 1985, 1990, and 2003. Peak loading design for the septic system is 2,062 GPD. No reserve area exists to install a new septic system. The absorption area was dry when probed. Health Department records indicate the septic tank was last pumped in June, 2003 and that the tank is pumped every 1 to 3 years. Water meter readings obtained in May, 2004 indicate the facility is using 600 GPD of water. Wastes generated in these businesses are likely to exceed residential wastewater strengths.

755 Walker Road, TM: 13-1-001-26, Verizon Telephone: The sewage disposal system serving the structure was installed in 1968 with an unknown peak design capacity. The drain field area was dry when probed. Should the sewage disposal system fail, enough area to replace the drainfield with a traditional absorption area appears to exist on site. The Health Department has no record of septic tank pump out on this property. Water meter readings obtained in May, 2004 indicate the facility is using 45 GPD.

761 Walker Rd., TM: 13-1-001-27, Great Falls Swim & Tennis Club: The system serving this facility was installed in 1972 and has no replacement area. Maximum design load for the system is 3,000 GPD. The Health Department has no history of malfunction or repairs to the system on file for this property. Attempts to probe the drainfield and check for wetness in the trenches were thwarted by 4' to 5' of backfill cover over the area. Health Department records indicate the septic tank was last pumped in June, 1997. Quarterly water meter readings obtained in May, 2004 indicate the facility is using 1,222 GPD.

780 & 790 Walker Rd., TM: 13-1-003-A, Village Day Care: The sewage disposal system serving the day care center was installed in 1985 and is designed to accommodate a peak waste load of 1,170 GPD. A condition of this system's approval is based upon the use of 1 gallon flush toilets in the day care/school. Repairs to the system, conducted in 1994 and 2001, included replacement of mechanical components in the pumping station and replacement of the distribution boxes. Replacement area for the absorption system does not exist. When probed, the absorption area was dry. Health Department records indicate the septic tank was last pumped in August, 2000. No further septic tank pump out records are on file with the Health Department. Quarterly water meter readings indicate the facility is using 1,044 GPD.

Data

Total Number of Properties Evaluated 22
Total Number of Absorption Areas Evaluated 26
Number of Commercial Sites with Multiple Commercial Establishments 7

Number of Sites with Absorptions Areas that are:
Less than 10 years old 5
10 to 24 yrs old 5
Greater than or equal to 25 yrs old 12

Number of sites with currently failing systems and no means of repair 2

Number of Sites showing indications of wetness upon probing 4

Number of sites with potentially high sewage strength 12

Number of Absorption Areas with known peak design of ≥1000 GPD 10
Absorption Areas with known peak design of ≥1000 GPD and greater than or equal to 25 years old 4

Number of Sites >3 years old with maintenance history showing inadequate or irregular Septic Tank Pump-out frequency 9
Number of Sites with >10 years old with maintenance history showing no Distribution Box repairs or inspection history 3
Number of Sites with Flow Diversion Valves Not Located 2
Number of Sites with trees, driveways, etc., over system 1
Poor landscape position due to landscaping & grading operations on neighboring sites 1

Number of Sites with 50% reserve 5
Number of Sites with 100% reserve ..... 4[3]
Number of Sites with ≥1000 GPD Day Design and 50% Reserve 0
Number of Sites with ≥1000 GPD Day Design and 100% Reserve 0

Number of Systems Greater than or equal to 25 yrs old with ≥50% Replacement Area . 2
Number of Systems with no installation records with≥50% Replacement Area 2

Notices will be sent to all the properties to pump their septic tanks as required by Chapter 68.1 of the Fairfax County Code.

[3] 1 site will require abandonment of an existing well and use of alternative technologies.